

Introduction

Everyone is familiar with the phenomenon of the ticking of a clock. A clock goes *tick tock, tick tock* in English, or *tik tak, tik tak* in Dutch. Why do we assign different vowels to the two ticks of a clock? Do the two ticks sound different? Some clocks have a mechanism that does in fact produce different sounds, but many clocks do not have such a mechanism. Nevertheless, those clocks are imitated as *tick tock, tick tock*. It is our own imagination that assigns a ‘tick’ to the first ‘tick’ and a ‘tock’ to the second. The fact that we do this collectively says something about the way our cognition works.

How does it work? Our cognition wishes to hear structure, in order to understand everything around us in easily manageable chunks. It wants to know the coherence of things. Therefore, everything is accommodated into hierarchies, with several levels, and one element on each level as the most important one, the head element. In the ticking of a clock, we decide that the two ticks form a group of two, and the first element of this group of two ticks is the most important one, to which we ascribe the /t/-sound, which is an intrinsically higher vowel than the /ɔ/-sound. We also think that we perceive it as louder, longer, and higher in pitch.

By accommodating all elements of a sounding object – or visual objects or movements – to a hierarchy of important and less important elements, the interpretational task is made easier. This dissertation is on language and music, which are both cognitive behaviors of people, concerned with sound. Several ways lead to the decision which elements are most important, and which groups of elements form domains together, such as syllables, feet, or phrases. In language and music, domains are based on the cohesion in meaning, structure, or form, or on distance or difference from other elements. Groupings on the basis of meaning (semantics) can differ from those based on phonological structure, which in their turn can differ from groupings on the basis of syntactic structure. Intonation, rhythm, pauses, etc. add their own grouping phenomena. In music similar influences play a role in structuring: melody, rhythm, rests, chord progressions, etc. From all these “cues”, our cognition has to

choose the most straightforward way to assign saliency to some elements, whereas other elements are seen as ornamentation.

In Chapter 1 we will show how these choices are made. We will describe a musical and a linguistic theory, which both give a similar account of how our cognition makes these decisions, defining the preference rules our cognition seems to make use of. We will show that language and music are rather similar in the above-mentioned respects, and in this dissertation we will investigate whether some processes occurring in language, in particular in speech prosody, can be explained on the basis of musical theory.

The main chapters are Chapters 3, 4 and 5, in which we describe the results of three prosody experiments.¹ Chapter 2 provides an introduction to the background theory on rhythm, which can be seen as the most obvious shared characteristic of language and music. The chapter gives an overview of some theoretical issues of the subject.

Chapter 3 concerns an experiment on rhythmic restructuring of secondary stress in words. An important issue in prosodic variability research is, for instance, the question whether the influence of a higher speaking rate leads to adjustment of the phonological structure or just to phonetic compression, or maybe just to a different perception by the listener. On the basis of the similarities between language and music and the insight that restructuring can occur in rate adjustments in music, we suppose that phonological adjustment/restructuring on account of differences in speaking style and speaking rate is possible. For this issue the phonologist could profit from the musicologist's knowledge.

Another subject of considerable debate in linguistics is that a mismatch seems to exist between syntactic structure and phonological structure. Syntactic phrases display recursivity, whereas this recursivity is assumed not to play a role in phonology. In music, however, recursive phrase structures are quite common, and this made us wonder why linguistic prosody would behave differently from both syntax and music. Moreover, recursion is found in all kinds of art and in nature as well. Section 4.2 gives several examples of different kinds of recursion; in the remainder of Chapter 4 we

¹ Sound examples from the experiments can be downloaded as mp3-files from <http://home.planet.nl/~schre537/sounds.htm> or www.maartjeschreuder.nl.

search for evidence for the idea that phonology exhibits recursive structures as well. We conducted an experiment in which we studied an instance of phrasal structure. Thus we investigated whether or not edge-marking processes, such as early pitch accent placement, can be applied recursively to phonological phrases that are embedded in larger phonological phrases, and we show that recursion in phonological phrases should be admitted in the prosodic hierarchy.

The third experiment (Chapter 5) concerns the question whether differences in emotional speech are characterized by different modalities. In music the difference between sad and cheerful melodies is often indicated as a difference between a minor and a major key. We will indicate that we may also speak in a minor key when we are sad and in a major key when we are happy.

These prosodic subjects have in common that music theory can help out in the issues involved. All three subjects, concerning rhythm, phrasing structure, and intonation or melody, are basic parts of music theory as well. They are to be seen as building blocks of a bigger whole, in language as well as in music, building hierarchical structures out of sound. Without structure we cannot understand it. As for the simple example of the ticking clock, we hear structure in each part, and we connect it to the properties of the sounding signal, until we have reconstructed the entire piece of music or (spoken) text.

